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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,783	06/20/2003	Metin N. Gurcan	ICA 0070 PA	5976

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EXAMINER	
AZARIAN, SEYED H	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 11/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/600,783	GURCAN, METIN N.	
	Examiner	Art Unit	
	Seyed Azarian	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/600/783*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/23/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-9, are rejected under 35 U.S.C. 103(a) as being unpatentable over Vining et al (U.S. patent 5,920,319) in view of Summers et al (U.S. patent 6,246,784).

Regarding claim 1, Vining discloses a method of detecting abnormalities in digital imagery comprising (column 2, lines 7-22, detecting abnormality);

providing a set of binary images derived from a plurality of slice images representing cross-sections through a body (column 4, lines 55-65, binary slices, also column 14, line 60 through column 15, line 20, different slicing);

performing a first spherical summation operation as a function of voxel locations in said set of images to provide a first spherical summation value (column 7, lines 10-27, classify the voxel as being inside or outside the object using a region growing procedure, also column 13, lines 17-34, refer to cutting plane "spherical-shaped" cutting plane, or cylindrically-shaped cutting plane);

performing a second spherical summation operation as a function of said voxel locations in said set of images to provide a second spherical summation value (see above also column 13, lines 47-67, refer to voxel, further column 14, line 60 through column 15, line 21);

computing a ratio of said first spherical summation value to said second spherical summation value (column 6, lines 41-53, the adaptive threshold value is calculated for each segment on every image at step 87 as an average value of several measured threshold values for each segment. Each adaptive threshold value can be calculated as a variable percentage of the difference between the average maximum and minimum attenuation factors for the corresponding intensity profile. For example, a percentage of 50% corresponds to the full-width-at-half-maximum measure of the intensity profile. The adaptive threshold values are then used to re-segment the region of interest at step 88 using a region growing process that can account for the varying threshold values.

However Vining discloses (column 6, line 53 through column 7, line 9, alternatively, the adaptive threshold values can be calculated by morphing a ring which represents the intersection of the airway and a perpendicular plane along the skeleton of the airway. The initial reference ring lies in the initial perpendicular plane and is the set of iso-value points of an underestimated threshold value on that plane in the largest branch of the airway. Using this ring as a reference, the threshold value is changed to create a new ring in the same plane, with a larger circumference and larger curvature values than the reference ring. If the increase in circumference and curvature values are below a certain limit, then the old threshold value is replaced by the new threshold, and the process is repeated. When the maximums are exceeded, the new threshold value is stored on the skeleton, the perpendicular plane is shifted to the next point on the skeleton, and the previous threshold value is used as the initial threshold value for the iso-value ring on the new plane. This process is repeated for every branch along the skeleton until every point in the skeleton has an associated adaptive threshold value. A variant of the marching cubes

can then be used to generate a variable-value surface using the variable threshold values. But does not explicitly state its corresponding "comparing said ratio to a threshold value and creating a set of detection images by turning voxels ON which exceed said threshold value". On the other hand Summers in the same field of detecting surface anomalies in anatomical structures teaches (column 7, line 66, through column 8, line31, Fig. 1, the process selects a seed point, which initially represents generation zero or a path length value of zero. In subsequent generations of growth, the process increments the path length value of new seed voxels, and the path length limit serves as a constraint on further processing of the segmented region at the new seed voxels. To avoid further processing in these cases, the process evaluates the accumulated path length, and if it exceeds a path length limit, the process terminates further growth originating from the current voxel. Processing then continues so long as other seed voxels remain. If the path length is not exceeded, the segmentation process computes the new voxel coordinates of a voxel location that represents the next generation of growth from the voxel currently acting as the seed. As described above, the coordinates of the current seed are modified to compute a new voxel location. The specific location of each new voxel computed from the current seed depends on the desired rate and direction of growth from the voxel. The characteristic value of the voxel at the new coordinates is evaluated to determine whether it falls within a predetermined threshold. Typically the characteristic value represents an intensity or radiological density value, but can also represent other characteristic data. If the characteristic value is within the threshold, the new location becomes a potential seed voxel in a subsequent generation of growth. Further column 19, line 58 through column 20, line3, refer to comparison).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Vining invention according to the teaching of Summers because it provides accuracy and visualization of internal anatomical structure, to surgeons, or other scientists.

Regarding claim 2, Vining discloses the method of claim 1 wherein said first spherical operation is performed over a spherical region of a first radius and said second spherical operation is performed over a spherical region of a second radius less than said first radius (see claim1, also column 7, lines 10-27, classify the voxel as being inside or outside the object using a region growing procedure, and column 13, lines 17-34, refer to cutting plane "spherical-shaped" cutting plane, or cylindrically-shaped cutting plane and column 13, lines 47-67, refer to voxel , further column 14, line 60 through column 15, line 21).

Regarding claim 5, Vining discloses the method of claim 4 wherein said segmentation corresponds to identification of an object within a body (column 5, lines 40-61, at step 35, a region of interest is segmented from the three-dimensional data volume. The purpose of segmentation is to isolate a region of interest within the three-dimensional data volume prior to three-dimensional rendering. In general, medical image segmentation is complicated by image noise, partial volume effects, and the fact that similar intensity values are shared by different anatomical structures. When a thin-walled soft tissue structure encompasses an air-filled lumen, segmentation of that structure can be effectuated by selecting the air column as the region of interest. Further, the outside surface of the air column corresponds to the inside surface of the organ of interest. Similarly, when a thin-walled soft tissue structure encompasses a contrast

enhanced blood-filled lumen, segmentation of that structure can be effectuated by selecting the contrast-enhanced blood column as the region of interest.

Regarding claim 6, Vining discloses the method of claim 5 wherein said binary mask has values of-1 inside said object and values of +1 outside said object.

Regarding claim 7, Vining discloses the method of claim 5 wherein said object comprises a colon (Fig. 10a, column 3, lines 46-65, refer to colon).

Regarding claim 9, Vining discloses the method of claim 1 wherein said abnormalities comprise polyps in a colon (column 11, lines 22-35, refer to abnormal structure of colon's lesions).

With regard to claims 3, 4 and 8, the arguments analogous to those presented above for claims 1 and 7 are respectively applicable to claims 3, 4 and 8.

Other prior art cited

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(U.S. patent 6,083,162) to Vining is cited for method and system for producing interactive, three-dimensional renderings of selected body organs having hollow lumens to enable simulated movement through the lumen.

(U.S. patent 6,366,800) to Vining et al is cited for automatic analysis in virtual endoscopy.

(U.S. patent 6,470,092) to Li et al is cited for process, system and computer readable medium for pulmonary nodule detection using multiple-templates matching.

(U.S. patent 6,345,112) to Summers et al is cited for method for segmenting medical images and detecting surface anomalies in anatomical structures.

Contact Information

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Azarian whose telephone number is (571) 272-7443. The examiner can normally be reached on Monday through Thursday from 6:00 a.m. to 7:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella, can be reached at (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR.
Status information about the PAIR system, see http:// pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Seyed Azarian
Patent Examiner
Group Art Unit 2624
October 29, 2006

Seyed Azarian